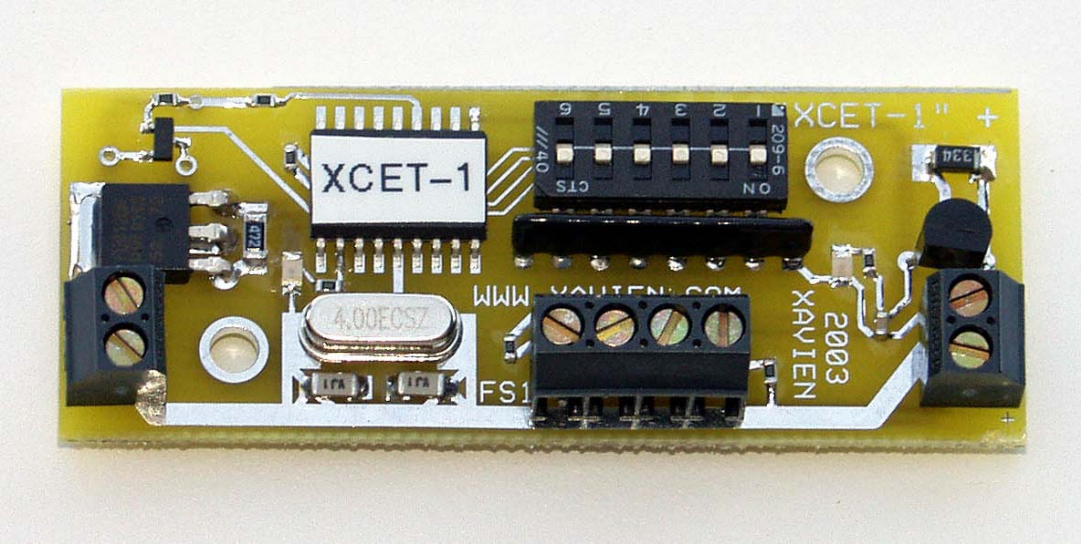
“XCET-1” - Xavien Continuous Event Timer

User Manual and Instructions



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System Overview

The “XCET-1” is a precise 1 second to 31 seconds continuous event timing system used to control events in a rocket, such as continuously triggering a camera for a user specified time. Time settings are set using a 6-position DIP switch that eases programming. It runs off of an external DC power supply ranging from +7V to +15V, a 9V alkaline battery is ideal for powering the “XCET-1”. Various igniters / electric matches may be used because of the versatility and design of the “XCET-1”; these include Daveyfire and OXRAL. The “XCET-1” can also be used to drive a solenoid, servo, relay or some other devices that requires repetitive actions.

Specifications

Battery	external 7-15 VDC
PEAK Firing Current	3A @ 10sec.
Dimensions	0.95” (+/- 0.05”) W x 2.5” (+/- 0.02”) L
Weight	14.2 grams
Nominal Battery Load	15mA
Delay Settings	1 second to 31 seconds (in 1 sec. increments)
Output Pulse Time	0.5 seconds or 1.0 second (user selectable)

Operational Overview

Figure 1 depicts the component layout of the “XCET-1”. The switches are labeled 1 through 6 accordingly. The ON position for the switches is labeled at the top of each DIP switch pack. Switch 6 is used to set the “ON” time of the output.

Figure 1. “XCET-1” Assembly.

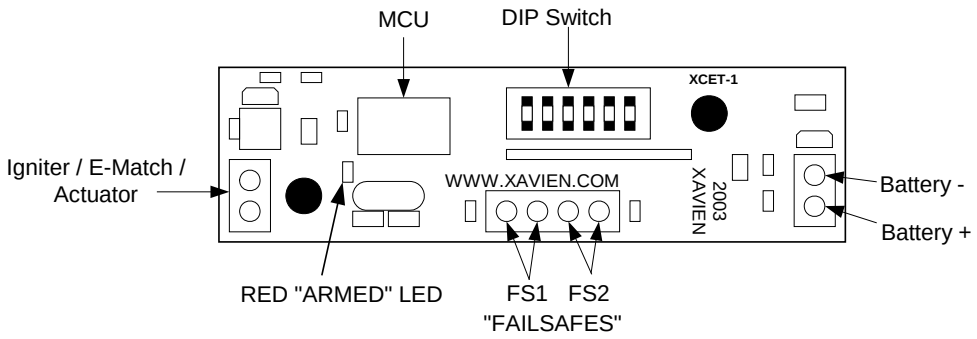


Figure 2 gives a close look at the DIP switches and explains time value of each switch. Table 1 gives examples of time settings. For example, to get a delay of 10 seconds you would turn ON switch 2 and switch 4 (2 seconds + 8 seconds = 10 seconds), rest would be OFF. The timing begins counting down as soon as **BOTH** failsafes are “OPEN” (disabled). If the unit is powered up with both failsafes “OPEN”, the unit begins counting down immediately. Make sure fail-safes are in place **BEFORE** applying power to the unit. Figure 3A and 3B gives examples of the output when the switches are setup as depicted. Switch 6 sets the “ON” time of the output. It can be set to either 0.5s or 1.0s. The output voltage is the same as the input, so if you have the input powered off of a 9V battery then the output will be 9V. So if you have the “XCET-1” set for 3 seconds with a PULSE time of 1 second and powered off of a 9V battery then the operation will be as follows:

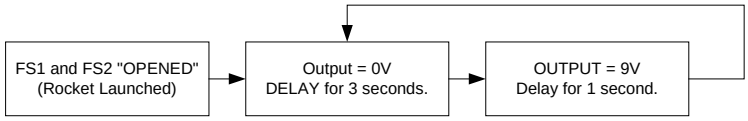
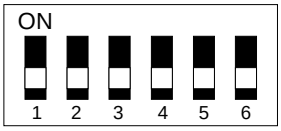


Figure 2. DIP Switch with all switches in the OFF position.



Switch	Time Value
1	1 second
2	2 seconds
3	4 seconds
4	8 seconds
5	16 seconds
6	PULSE “ON” TIME

**** IMPORTANT**: Switches *MUST* be set prior to turning power on to “XCET-1”. The MCU *ONLY* reads the switch settings on power up. If changes need to be made, turn unit OFF, set switches and cycle power back ON.**

Table 1 (Example of delay settings)

Switch Setting [1, 2, 3, 4, 5, 6]	Time Delay
Off-Off-Off-Off-Off-Off	Delay = 1 second (default), ON time: 0.5s
On-Off-Off-Off-Off-Off	Delay = 1 second, ON time: 0.5s
On-Off-On-Off-Off-Off	Delay = 5 seconds, ON time: 0.5s **(FIG. 3A)**
Off-On-Off-On-Off-Off	Delay = 10 seconds, ON time: 0.5s
Off-On-On-Off-On-Off	Delay = 22 seconds, ON time: 0.5s
On-On-Off-Off-Off-On	Delay = 3 seconds, ON time: 1s
Off-Off-Off-On-Off-On	Delay = 8 seconds, ON time: 1s
On-On-On-On-Off-On	Delay = 15 seconds, ON time: 1s
Off-Off-On-Off-On-On	Delay = 20 seconds, ON time: 1s **(FIG. 3B)**
On-On-On-On-On-On	Delay = 31 seconds, ON time: 1s

Figure 3A.

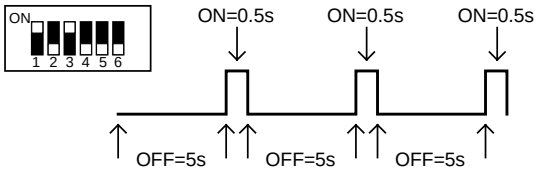
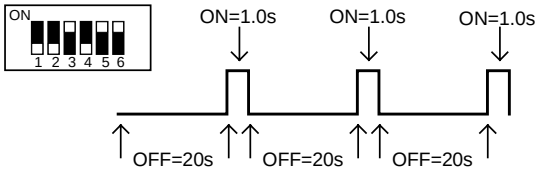


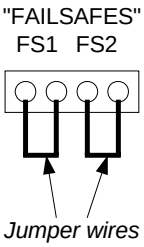
Figure 3B.



“XCET-1” FAILSAFES:

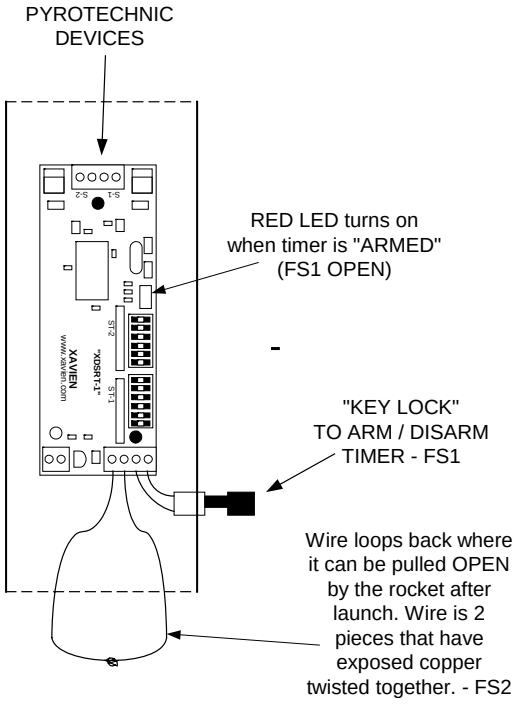
The “XCET-1” has two failsafes to protect against accidental timer countdowns. The failsafes are “ENABLED” when “FS1” and “FS2” are connected together as in figure 4. The unit will NOT begin countdown until BOTH failsafes have been “DISABLED” (opened).

Figure 4. FAILSAFES “ENABLED”.



Once a failsafe has been “DISABLED” (opened), the only way to reset the failsafe is to turn the power off. Once this is done you can “ENABLE” the failsafe and turn the power back on. We at XAVIEN have had good luck using “solder” as the jumper wires for the failsafes. Place the length of solder directly under the engine, when it ignites it will melt the solder and countdown will begin. Figure 5 shows a basic configuration for using the failsafes for the XAVIEN family of timers.

Figure 5. Basic FAILSAFE configuration



<u> IMPORTANT**:</u> All connections (FAILSAFE settings and switch position) must be set *BEFORE* you apply power to the “XCET-1”.**

Pyrotechnic / Actuator Installation:

The “XCET-1” can be used as a traditional ignition timer and has been tested using various igniters and electric matches. To install a pyrotechnic device onto the “XCET-1” you simply unscrew the terminals located as in figure 5. The terminals are screw based terminal blocks for easy access and reliability. *User does not need to worry about which terminal goes to which leg of the igniter / electric match.* Make sure you **hand tighten** screw terminals after igniter / electric match has been installed.

Figure 5A. Pyrotechnic device install location.

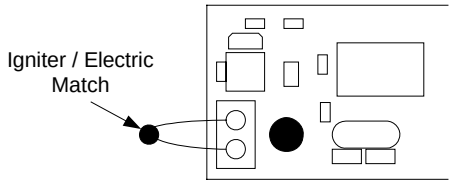
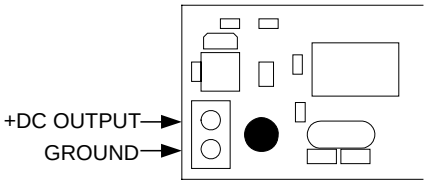


Figure 5B. Actuator device install location.

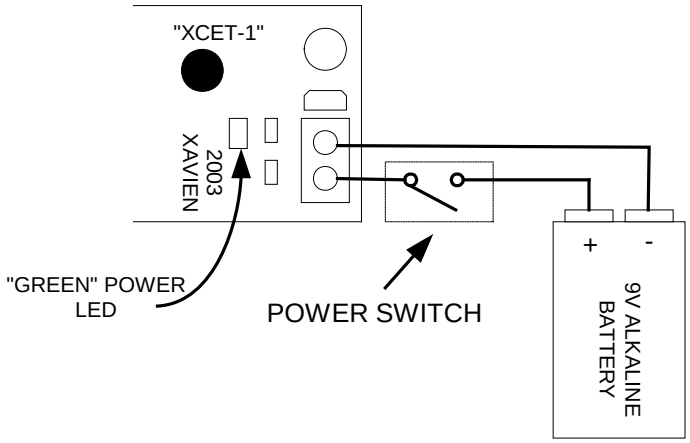


When installing an actuator correct polarity must be observed. The output of the “XCET-1” is the same voltage that it uses as the input. For example, if you are using a 9V battery, then your output will be 9V. The “XCET-1” can continuously handle 2 amperes (2A) of current up to 15VDC or 3A surge at 15VDC for 10 seconds. If you exceed this rating damage to the unit can occur.

Battery Connections:

The “XCET-1” was designed to operate using a 9V alkaline battery. We here at XAVIEN recommend using a switch (3A MAX CURRENT) to insure ease of use when powering the unit up and down. We have equipped the unit with a small green power indicator so the user can easily identify when the unit has power applied. It is recommended that the user do tests using their igniter / electric match configurations before “assuming” anything will work. This will help to insure that the “XCET-1” and your configuration will work to your expectations. In figure 6 we have a basic diagram of the battery connections that are recommended by us. **It is always a good idea to insure you have a fresh (new) battery before any launches occur. After all, the cost of a battery is nothing compared to the time and money spent on many of our users rockets.**

Figure 6. Recommended battery connections.



Setup Sequence:

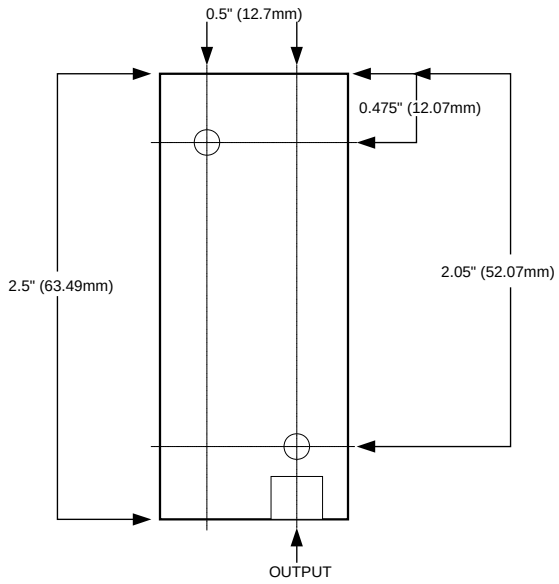
This is the recommended sequence for setting up the “XCET-1”.

1. Make sure unit is **NOT** powered up, if it is turn it OFF,
2. Set DIP switches to desired time delay.
3. Install failsafes, making sure screw terminals are not loose, hand tighten only.
4. Install igniter / electric match or actuator, making sure screw terminals are not loose, hand tighten only.
5. Install a fresh 9V battery, making sure screw terminals are not loose, hand tighten only. Reversing the polarity of the battery can damage the “XCET-1”, when installing the battery refer to **figure 1** for the correct polarity.
6. If green LED is ON, turn switch to OFF position if you will not be immediately launching your rocket. This saves on the life of the battery. When you are ready to launch, turn switch to ON position, the “XCET-1” is ready to go.
7. When unit is powered up (green LED is ON) verify that the RED “ARMED” LED is off. If this is on then the rocket is armed and waiting for the second failsafe to be disabled. This is usually only desired right before the rocket is launched. **If the RED LED is on and this is an undesired state, immediately turn off power to the “XCET-1” and check your failsafes.**

Mounting / Installation

The “XCET-1” must be installed securely to prevent the unit from being damaged during use. Since this unit does not depend on a “g-switch”, orientation of the unit is very flexible. The mounting holes are 0.125”; this allows various size screws to be used. Just verify the clearance of both the screw and the head to insure a proper fit without damaging the unit.

XCET-1



URGENT: *The “XCET-1” MUST be protected from ejection charge and motor residue. These are corrosive and over time can damage the PCB of the “XCET-1”. If this occurs, the warranty does not cover this type of damage.*

** Handling Precautions **

These units are sensitive to damage from ESD and should always be handled in a properly grounded environment; damage from ESD is not covered under the warranty. Never transport or handle a rocket with an “XCET-1” that is powered up and connected to live polytechnic charges. When installing an “XCET-1” to igniters, make sure unit is powered off. Before cycling power ON verify that both fail-safes are ARMED to prevent accidental discharge.

!! Product Disclaimer and Limit of Liability !!

Since the use and application of this equipment are beyond our control, the purchaser or user agrees to hold “XAVIEN” and their agents from any and all legal claims, demands, actions, debts, liabilities, judgments, costs and attorney fees arising out of, claimed on account of, or in any manner predicted upon loss or damage to property of, or injuries to or death of, any and all persons arising out of the use of this equipment. Due to the nature of electronic devices, the application and environments for these devices, the possibility of failure can never be completely ruled out. It is the responsibility of the purchaser or user of this equipment to properly test and simulate the actual conditions under which the device is intended to be used to ensure the highest degree of reliability, safety and success.

!! Product Warranty !!

The “XCET-1” has a warranty of 1 year starting from date of purchase as long as all the guidelines have been followed that are outlined is this document. Any improper use or carelessness on the part of user will void the warranty. If your unit has problems send an email to:

RMA@XAVIEN.COM

Once this has been done, XAVIEN will send you a return material authorization (RMA) number that you need to include with your unit. **DO NOT send any units back to XAVIEN without this RMA number, if we receive product with no RMA it will NOT be accepted and mailed back unrepaired.**

Revision History

PCB REV: 1.00A	DATE: 09/10/2003
FW REV: 1.00A	DATE: 09/10/2003
DOC REV: 1.00A	DATE: 09/10/2003